WHAT YOU SEE IS WHAT YOU GET? A COMPARISON OF THEORETICAL LENSES TO STUDY TECHNOLOGY IN ORGANIZATIONS

Completed Research Paper

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Abstract

This paper investigates how the application of different theoretical lenses impacts theorizing on technology in organizations. Based on a case study of a corporate Wiki introduction, three theoretical lenses are applied as sensitizing devices: a process theoretical analysis based on the Enterprise Systems Experience Cycle (Markus and Tanis 2000), a structurational analysis based on technologies-in-practice (Orlikowski 2000), and a sociomaterial analysis based on the mangle of practice (Pickering 1995). The authors reflect upon their own experiences in applying these and present a comparison of their observations. In doing so, the paper identifies and analyzes five emergent issues in theorizing across the three lenses: the role and nature of technology, technological change, changing practice, organizational change, and understanding stability. Similarities and differences among these three lenses are discussed and conclusions are drawn with respect to how what we as researchers see through our theoretical lenses determines what we will get in terms of theories. The paper thus presents other researchers with an opportunity to reflect upon the authors' experiences and supports the choice of an appropriate theoretical lens for studying technology in organizations.

Keywords: Theory, Theory Building, IT-enabled change, Process Theory, Structuration Theory, Sociomateriality, Technological Change, Organizational Change

Introduction

As researchers in the information systems domains, we typically have a strong interest in organizational as well as individual aspects of the adoption and use of information technologies. As a nexus of research at the intersection of social and technological systems (Lee 1999, 2001; Orlikowski and Iacono 2001; Sidorova et al. 2008; Weber 2003a), we have drawn on a variety of theories to be able to identify, explain, and predict how organizations, individuals, and technology interact in the context of this phenomenon (e.g., Dwivedi et al. 2012; Mingers and Willcocks 2004). As Popper (1980, p. 59) observes, the theories we use in our research "[…] are nets cast to catch what we call 'the world'; to rationalize, to explain and to master it." Following this logic leads to the observation that a theoretical lens, as an input to research, acts as an important sensitizing device for researchers and enables them to make meaningful observations in the empirical world (Bacharach 1989; Brief and Dukerich 1991; Colquitt and Zapata-Phelan 2007). Beyond that, as an output of research, theory provides researchers with the ability to represent their perceptions (Weber 2012) and is an important vessel to document and accumulate knowledge about the phenomena studied (Corley and Gioia 2011; Dubin 1978; Weber 2003b). Participating in this discourse – that is, making theoretical contributions – is one of the key drivers of scientific progress (Steinfield and Fulk 1990). In the course of this development, what we as scholars see and abstract from our observations of technology in organizations today shapes how we look at the very same phenomenon in the future.

To illustrate how the conclusions we draw from empirical observations are influenced by the choice of theoretical lens we use our own experiences in working with different lenses to make sense of technology and the social. Based on a field study in a corporation implementing an internal Wiki, we illustrate how three different sensitizing devices affected our interpretations of the very same setting. In a first study (Raeth et al. 2010), we employed a process theoretical analysis based on the Enterprise Systems Experience Cycle suggested by Markus and Tanis (2000). As some of the emergent phenomena could not be accounted for in this perspective, we conducted a structurational analysis based on Orlikowski's (2000) practice lens a subsequent look at the same case (Raeth et al. 2011). Finally, to account for some of the controversy between the first two studies, a third analysis of the case (Raeth and Mueller 2011, 2012) produced a sociomaterial account based on Pickering's (1995) mangle of practice. In this order, these analyses were developed based on our fieldwork conducted between 2009 and 2012. They represent a continuum of different process oriented theories: reaching from an organizational imperative perspective (Markus and Robey 1988) for the narrative process theory, to an emergent or mutual shaping perspective (Markus and Robey 1988; Orlikowski and Scott 2008) for the structurational practice-lens account, and an entanglement perspective (Orlikowski and Scott 2008) for the mangle.

This journey through different types and facets of IS research resulted not only in theoretical discoveries, but also in insights concerning theory and our process of making sense of our empirical observations per se. Hence, the illustration of the study's impact on our interpretation can be understood as a type of reflective account, which highlights, analyzes, and discusses our experiences in the research process. In this paper, we thus describe our interpretational process and not our fieldwork. In addition to the journey as such, we are also able to provide insight into the rather novel research stream of Sociomateriality (Orlikowski 2010; Orlikowski and Scott 2008). It provides an ontology addressing the social and the technological described above. We intend to shed light on what can be gained by adopting Sociomateriality despite its ontological complexity in comparing our sociomaterial interpretations to the ones gained using the other lenses. Overall, the question we address in this paper is thus epistemological in nature: *How do different theoretical lenses change our understanding of technology, organization, and their relation*? In response to this question, we develop a framework that enables us to differentiate between the theoretical lenses and their treatment of technology and organization. We find that all treat technology, but to a different extent with technology taking on different roles. The same holds true for the organizational aspects and their relation to technology and change. We derive implications on when and how to apply the different lenses and what their effect on our theorizing can be.

To present these findings, we first introduce the three lenses we use to make sense of our case findings as well as to our understanding of their role in our research. These lenses are then compared and synthesized. In section three, we introduce the case example we used and identify a set of key issues illustrating the differences and similarities among the interpretations that result from our different theoretical stances. In section four, we analyze each of the emergent key issues and draw a set of conclusions with respect to the lenses' implication for studying technology in organizations. A comparative framework summarizes our reflections. Concluding the paper, we synthesize our findings and their implications, discuss the paper's limitations and corresponding opportunities for future research, and illustrate the contribution of our work to research and practice.

Foundations

Meta-Theory

In the research we are presenting here, we are interested in how our understanding of the relation between social and technological systems has changed with the evolution of the theoretical paradigms we draw on to make sense of the world. As such, these three perspectives should rather be understood as a way of thinking about the world and not as an empirically testable explanation of social behavior. Consequently, we think of the theories we analyze as meta-theories rather than theories in a more narrow sense. In line with Popper's (1980) line of thought, figure 1 depicts how these lenses or sensitizing devices help researchers to derive abstract conceptual interpretations from their empirical observations.

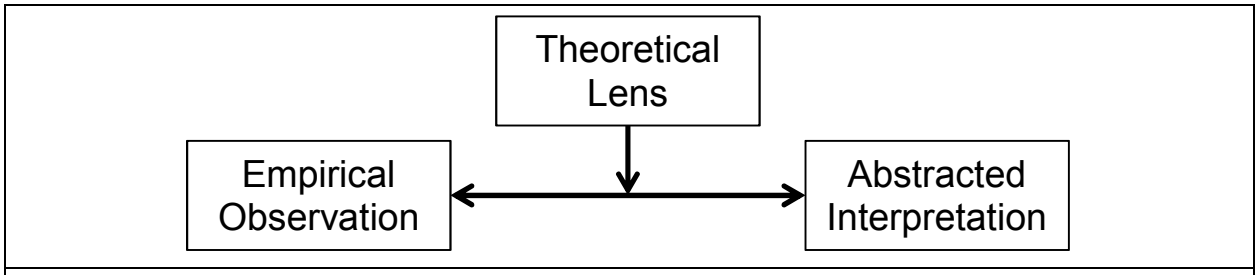

Figure 1. From Observation to Interpretation

Such meta-theories transcend other, more narrow theories in that they constitute a theory about theories which, in turn, are abstractions of the empirical (Furfey 2011). One way of understanding meta-theories is looking at them as meta-models for theories; much like in, for example, software or process modeling. Meta-theories can be used as guidelines for creating more context- or system-specific models of observable behavior; the latter being theories in the more narrow sense mentioned above. Meta-theories help researchers to be sensitive towards the ontological constituents and context of the phenomenon they investigate and thus help to identify relevant constructs and meaningful relations (Milton and Kazmierczak 2006). In this capacity meta-theories can shape the theoretical understanding of disciplines through facilitating theory development (Bostrom et al. 2009; Ritzer 2001) and providing a way of thinking about other theories (Gregor 2006). Following this notion, we look at the three perspectives we investigate as sensitizing devices – a kind of scaffolding that helps us to build conceptual models of phenomena in the empirical realm.[1]

An example from the three perspectives we analyze is structuration theory: In his seminal work, Giddens (1984) already points to the meta-theoretical nature of his work. Since then, his work and its implications on IS research have been analyzed frequently and the meta-theoretical nature has been underlined consistently (Gregor 2006; Jones and Karsten 2008; Weaver and Gioia 1994).

Process Theory

Researchers following the stream of process theory (PT) aim to identify interconnected events that lead to a certain outcome. Their aim is to discover why a certain outcome occurred by connecting the events that led to the outcome (Langley 1999). PT does not refer to consequences as variables. Instead, they are phenomena representing changes in states (Markus and Robey 1988). While, variance theory explains relationships in terms of dependent and independent variables connected by a causal relationship (more X results in more Y), PT concentrates on sequences and their adjunct events that lead to a distinctive outcome (do X, then Y to achieve Z) (Langley 1999; Markus and Robey 1988). In the tradition of Mohr (1982), PT seeks to understand and explain necessary (but not sufficient) conditions for events to occur. That is, from the final outcome one works backwards to the initial state to identify necessary conditions for the final outcome to occur. The key element to PT then is the event (Langley 1999) and not the variable. In other words, PT refers to the causal

[1] Meta-theories can also be understood as a summative integration of existing theories (Ritzer 1990; Uto 2005). As such, they emerge from a more elaborate analysis of extant theories and provide a consolidated understanding of the phenomenon described by these theories. While this is a rather common perspective on meta-theories in the IS discipline (e.g., Petter et al. 2008; Venkatesh et al. 2003), our understanding of meta-theories is rather one of further ontological abstraction or a kind of paradigmatic scaffolding (as, e.g., Bostrom et al. 2009).

explanation of a sequence of events over time as a result of the temporal ordering and probabilistic interaction of numerous events (Langley 1999; Mohr 1982; Van de Ven and Poole 1995). Including technology into a timeline of actions, events, and choices leads to asking for its role. According to Markus and Robey (1988), technologies take on two specific forms in PTs: the role of a dependent variable which serves an organization's information processing needs or the role of an occasion for an emerging organizational structure. We first focus on the former's properties and return to the latter's in the section on structuration theory.

Dealing with a sequence of events over time is associated with multiple levels and units of analysis. This notion can be extended as far as saying that PTs' levels of analysis are "made up of a continuum" (Langley 1999, p. 692). Not doing so may lead to micro or macro level fallacies (Burton-Jones and Gallivan 2007; Markus and Robey 1988) that misjudge relationships at other or across levels of analysis. Consequently, reconstructing a series of events, choices, and activities becomes a difficult endeavor as these entities are – more often than not – hard to define. Field data is often complex and researchers are urged to engage in specific strategies to make sense of data in order to attain the appropriate mix of levels and units of analysis. Further, PTs can take different forms. Van de Ven (1992) proposes four differing types: life cycle, teleology, dialectic, and evolution. A life cycle model represents a unitary sequence of events moving toward an altered state. Teleology models describe multiple ways to reach an end state by planning, implementation, and adaptation. Dialectic models represent a "recurrent convergence of multiple divergent progressions" (Van de Ven 1992, p. 176) while struggling with contradictory events. Finally, evolution theories follow a recurrent iteration of variation, selection, and retention. Depending on the form of phenomenon, researchers may chose the approach that fits best to account for the complexities found in their data.

The lens we used in our research is a specific instance of a life cycle PT: The Enterprise System Experience Cycle (ESEC) by Markus and Tanis (2000). It states that the adoption of an Enterprise System is accomplished in four phases. The first phase in this model is the *chartering phase* and leads to the funding of the IS to be implemented. The major outcome of this phase is a decision whether or not to proceed with system implementation. The subsequent *project phase* focuses on having the selected IS implemented in the targeted organizational units. The *shakedown phase* follows and involves the organization "coming to grips" with the software. This phase ends when normal operations have been achieved. In the *onward and upward phase*, the organization is finally able to ascertain the benefits of its investment. Finally, the organization can assess whether its investment has been a success. Each phase and its events have a set of necessary conditions for the following phase to occur and thus closely follows Mohr's (1982) process perspective.

Structuration Theory

Researchers within the structuration theory (ST) paradigm focus on social practices ordered across time and space as the object of study (the unit of analysis). These social practices are determined by recursive actions of knowledgeable human agents. Such knowledgeability is in turn based on the notion that all action exhibits reflexivity in that humans hold reasoned intentions on which individuals are able to discursively elaborate on. Elaborating this argument, Giddens (1984) describes a duality: *Structure* shapes and is shaped by the actions of human agents and human *action* shapes and is shaped by structure. This *duality of structure* recapitulates Giddens' position that structure is the medium and outcome of the conduct it recursively organizes. The structural properties of social systems, then, "do not exist outside action but are chronically implicated in its production and reproduction" (Giddens 1984, p. 374). In sum, the structural properties of social systems are medium and outcome of an agent's actions and hence enable and constrain their behavior (Giddens 1984). Giddens introduces modalities of structuration as a connecting element between structure and agent. Human agents interact through communication. To make sense of these interactions, actors draw back on interpretative schemes. This bears two important consequences: First, actors produce and reproduce existing interpretative schemes through their act of communication. Second, the production and reproduction of interpretative schemes also sustains or alters existing structures of signification and meaning. Power is exerted through facility, which Giddens separates into allocative resources (e.g., land or raw materials) and authoritative resources (e.g., persons or actors). Hence, actors exert power through their command over authoritative or allocative resources, therewith producing and reproducing structures of domination. Alike, actors draw back on norms to interpret sanctionable actions. Through the enactment of norms, actors produce and reproduce what is sanctionable in social systems, therewith altering and sustaining structures of legitimation. Note however that the above distinctions are only analytical in nature. In reality, they are closely connected.

To classify ST and its relation to technology studies, we pick up the previous section's definition by Markus and Robey (1988). They postulate the emergent perspective to be a variant of PT, which focuses on the ongoing

interactions between agency, context, and technology. There is no cause for change, such as technology, but only an occasion for structuring (Barley 1986; Orlikowski 1992) which may result in unpredictable outcomes. Eventually, theories engaging in the mutual shaping of said agency, context, and technology were redefined in conceptualizing them as more deeply integrated with organizational structures. Structurational theories thus still embody a process perspective. However, the focus on practices necessitates to rethink traditional anchor points in classical strategies such as the ones proposed by Abbot (1990), Van de Ven (1992), and Langley (1999). Based on a review of existing technology studies focusing on ST, Pozzebon and Pinsonneault (2005) propose that we have to shift our attention to a study's purpose in relation to ST's concepts (e.g., actor/structure, knowledgeability, time/space, power, etc.). The anchor of study then revolves around the ST-related focus concerning a social practice. Hence, they recommend combining the strategies put forward by Langley (1999) to account for the complexities of practice to accommodate for the increasing complexities inherent to ST and the data used to theorize.

For our second lens, we draw on Orlikowski's (2000) practice lens. She draws on ST in arguing that "structures of technology use are constituted recursively as humans regularly interact with certain properties of a technology and thus shape the set of rules and resources that serve to shape their interaction" (Orlikowski 2000, p. 407). Thus, a system's symbols, properties, and designer's worldviews are enacted in practice; technologies-in-practice (TiP) emerge. These allow for "attention on how structures are constituted and reconstituted in recurrent social practices" of technology use but, at the same time, acknowledge that users "also can and do circumvent inscribed ways of using the technologies" (Orlikowski 2000, p. 407). The practice view of technology thus proposes that TiPs represent structures. Hence, human agents recursively draw on existing structures (both TiP and other structures) and therewith reconstitute these.

Sociomateriality

Sociomateriality assumes that material and human agency are interwoven and thus represent a duality; one cannot exist without the other because their relation to another constitutes their existence. Thus, they are "constitutively entangled in everyday life" (Orlikowski and Scott 2008, p. 1437), which means that everything only emerges and exists in relation to practice. Several theoretical perspectives have addressed this issue, amongst which are actor network theory (Latour 1992; Law 1992), mangle of practice (Pickering 1993), apparatus (Barad 2003), and human-machine (re)configurations (Suchman 2007) – to name only a few examples. Overall, two ontologically separate schools of thought addressing this topic have emerged. One assumes ontological inseparability arguing that the social and the material are separable only analytically (Orlikowski and Scott 2008). The other follows a Cartesian logic – such as Descartes in his statement of the mind body dualism –in that it argues for an interlocking (Leonardi 2011) between the social and the material, but disputes the inseparability from an ontological viewpoint.

Both have different implications for studying technology in organizations. From an ontological viewpoint, it follows that technology in general, and information systems in particular, belong to the sociomaterial practice one observes. Everything only exists in *relation* to the practice. This relationality, as some argue, also leads to a reconceptualization of the language we use to describe technology in practice (Suchman 2007, cited in Orlikowski 2008). For example, Croon (1998, p. 10), in reviewing work on Sociomaterial lenses, even goes as far as saying that IS researchers should refrain from speaking of "using technology" and head towards "*being with*" technology. Similar to ST, Sociomateriality represents a type of process theory, too. Yet again, it employs different foci in that it stresses the importance of the roles of the social *and* the material in shaping and being shaped by practice. In addition to their respective relations to practice, also the mutual relations of the two gain importance in theorizing technology in organizations.

In our case example, we focus on Pickering's (1993, 1995) mangle of practice. Pickering argues that not only do humans have agency, but materials do as well. The crucial difference is that only human agents pursue goals, visions, and dreams (i.e., they have intentions). Both are, however, not separate, but temporally, "mutually and emergently productive of one another" (Pickering 1993, p. 567). He goes on to argue that human agents, in their pursuit of goals, encounter resistance by the material they are entangled with and consequently engage in a dialectic of resistance and accommodation (Pickering 1993, 1995). When agents encounter resistance by the material, they may accommodate the material (e.g., a machine or device) by tuning it to achieve their goals or adjust their goals, instead. Tuning implies the making and breaking of associations which refer to the linkages between people and things in practice (i.e., the sociomaterial assemblage). Over time, experiencing resistances, tuning, and establishing accommodations iteratively lead to an interactive stabilization, a practice in which all

resistances have temporarily been overcome. Wagner et al. (2010), for example, apply the mangle of practice to the implementation of an Enterprise System by describing the processes of resistance and accommodation. It is stressed that the design is "motivated by [...] how, where, and when" negotiations (i.e., resistances and accommodations) took place (Wagner et al. 2010, p. 281). A narrative, grounded, and longitudinal approach guaranteed their ability to observe micro level changes (in short periods when negotiations were present), macro level changes (over the course of the seven year study), and interactions. Overall, such a study design helps to observe the emergence of new practices without losing sight of the entanglement.

Summary and Comparison

Using a set of common characteristics, we compare the three lenses introduced in the previous sections (table 1). Looking at the sensitizing devices' ontological differences and similarities, we observe that the lenses' focus moves from a rather pure emphasis on events in the PT context to an entangled and relational perspective in the mangle of practice. These ontological differences bear important implications for all the other dimensions in table 1. Starting with the ESEC, methodological recommendations revolve around being able to follow a phenomenon over time while acknowledging that "certain phenomena will tend to be absent from a systematic list of ordered incidents" (Langley 1999, p. 693). Consequentially, the events absent due to lack of data or focus will not end up in the explanatory mechanisms provided by the process theory. Another reason lies in the level of analysis fallacies that might lead to missing micro-macro interactions necessary to understand the phenomenon of interest.

Turning to ST, we observe that the focus on social practices necessitates the combination of temporal strategies (when) and narratives (why) in order to make sense of the micro-macro interplay to be found in social practices (Pozzebon and Pinsonneault 2005). ST's focus on social structures also implies a different meaning of usage, which revolves around the social structures that are influenced by the introduction of technology. Orlikowski (2000) refers to enactment to signify the mutual shaping of technological properties and social structure of, for example, the organization.

Table 1. Comparison of the Lenses

	ESEC *(Markus and Tanis 2000)*	***Practice lens*** *(Orlikowski 2000)*	***Mangle of practice*** *(Pickering 1993, 1995)*
Ontological Assumptions	Causal explanation of a sequence of events over time (Mohr 1982)	Structures act as rules and resources shaped in and shaping social practice (Giddens 1984); mutual dependence	Human and material are entangled (Pickering 1995)
Methodological recommendations	Longitudinal qualitative studies (Langley 1999)	Combination of several types of longitudinal qualitative studies, thick descriptions (Pozzebon and Pinsonneault 2005), emphasis on processes	Longitudinal data, thick descriptions, elements representing relationality, materiality
Structure / agency	Human agents do things at some point in time (events, activities, choices ordered over time) within context	Human agents draw on and shape structure in practice	Human and material agency is intrinsic and constitutive to practice
Unit / level of analysis	Actors and events (Langley 1999)	Social practice (Giddens 1984), technologies-in-practice (Orlikowski 2000)	Sociomaterial assemblage/practice (Orlikowski and Scott 2008; Pickering 1995)
Usage terminology	Use, various entities, no specialized terminology	Enact (Orlikowski 2000), emphasis on how technology is put to use/enacted	Being with (Croon 1998), focus on relation to other things/context

When moving to the mangle of practice, we recognize another shift as compared to the technologies-in-practice lens. First, the unit of analysis shifts from social practices to sociomaterial assemblages. This implies our second shift, the inclusion of materiality as agency. The resulting performativity implies that practice shapes and is shaped by practice; with both human and non-human events playing a role in creating future practices. Hence, the previous descriptions of usage do not fit. So far, usage and enactment implied separate entities with the human as the locus of action; material is merely a tool, an extension implicated by the social. However, in an entangled assemblage, the technological (i.e., the material) becomes an emancipated part of the practice. Breaking associations in the entangled social and technological may better be described as being with things. In summary, table 1 provides some indication as to how and why a lens might influence the interpretation of a phenomenon in a specific setting.

The Case

Data Collection and Analysis

Data collection took place at Hermes, a corporation in the airport industry managing several airports worldwide. Between 2009 and 2012, the time of our presence in the field, the company had about an average of 20,000 employees and average annual revenues of approximately EUR 2.3 bn. The data collected reaches from 2004 to 2012, while the actual data collection period took place from 2009 to 2012. Originally, the firm was approached to answer the question of how to successfully implement an organizational Wiki, but evolved as we got to know the case better. During the time at Hermes we interviewed 24 employees, which played different roles during the development (project team, management, IT department), implementation (test users, project team, IT department), and later periods (management, general wiki users, other departments) of the Hermes Wiki. The interviews lasted between 30 minutes and 2.5 hours. Furthermore, we collected usage data, internal surveys, presentations, actual Wiki entries, secondary interview data, press releases, and various other documents that were deemed relevant to the setting in the eye of our key informants.

For data analysis, the interviews were transcribed and coded and a careful analysis of all the relevant documents allowed for an immersion with the data. Following the three differing lenses we employed different analysis strategies. The PT approach followed a narrative design (Ramiller 2001; Ramiller and Pentland 2009), which represented a story containing an actor, an action, a goal accomplished by certain means, a specific setting, and a particular outcome (Ramiller and Pentland 2009). Four researchers first carefully read the material and then coded actions and events. The resulting list was then summarized into a general story, starting with actions by a small group of initiators from which the final outcome is derived. Finally, the list was used to create an abstraction of the narratives into a three-phase model. For the ST approach, we followed Pozzebon and Pinsonneault (2005) and analyzed our data based on the elements provided by ST (structures, interpretations, norms) as well as resulting events from differing sense making strategies (Langley 1999). Here we rather focused on the differing intentions, strategies, practices, and other concepts relevant to ST Finally, for the mangle of practice perspective we relied on a narrative approach similar to the ST approach. In addition, we carefully considered material agency. This was achieved through following the nature of the Wiki from a technological (e.g., what plugins were used, what markup language, were design changes made, etc.) as well as a social standpoint (how was the Wiki seen by employees).

Case description

Based on the analysis described above the Hermes case serves as an illustration as to how the interpretation of organization, technology, and their relation is changing when switching theoretical lenses. Founded in the early 20th century, Hermes started out as a state-owned corporation that was established to manage a local airport in Germany. Historically, the organization exhibited a rather bureaucratic organizational culture, strong departmental structures, and a high degree of hierarchy.

In 2001, the company went public. This triggered its transformation to a global player in the airport industry and resulted in a major transformational initiative to professionalize the company. Starting in 2003, this initiative aimed at realizing synergies and eliminating redundant work practices in the company. As such, it touched upon many organizational aspects and was seeking to bundle existing management information systems. One of the corresponding projects was a multi-year knowledge management initiative that took place between 2005 and 2007. Its overall objective was to overcome the company's functional silos, particularly in light of scaling its operations internationally. With knowledge recognized as one of the company's most vital resources in this

context, one of the informants we interviewed expressed his appreciation of the initiative: "*finally somebody takes care*" (QU:33:4). Employees encountered problems such as the unidirectional and often isolated handling of knowledge to the extensive use of external sources (search engines or major online encyclopedias) when searching for information to complete tasks. Consequently, a survey administered when searching for problems and inviting ideas for solutions highlighted a broad set of issues in knowledge retrieval, storage, and production. With respect to the latter issue, knowledge production, the survey highlighted that a broad set of people at Hermes was thinking of a Wiki as a possible solution to the problem. Strongly inspired by Wikipedia, the resulting "knowledge market" was thought of as emphasizing collaborative production of knowledge and providing a central platform for organizing and exchanging corporate knowledge.

As one of the results of the KM initiative, the chief knowledge officer presented new concepts for knowledge management to the vice president of human resources in 2006. One of these concepts suggested the design and implementation of an enterprise-wide Hermes Wiki. After approval, the Wiki project started with eight key members who were chosen based on their expressed interest in the topic. As for the technical design, the project team decided to go with the WikiMedia engine, which had subsequently to be adapted to Hermes branding and infrastructure. To increase the Wiki's attractiveness and make it a meaningful source for the employees, the project team solicited 500 articles to provide initial content. Early in the project, this led to a first need to adapt the concept. Within the initial articles written, redundancies with the existing intranet solution emerged. As a consequence, first rules for the wiki and its role in the organization were devised. For example, official corporate content would go on the intranet and the Wiki would only link to it. Beyond the content, also the purpose of the Wiki had to be determined. As an environment that supports joint production of knowledge, the collaborative style of writing and editing articles was anticipated to cut across traditional organizational structures. Moreover, the strong hierarchical structures were anticipated to adversely impact peoples' willingness to contribute. As a response, the Hermes Wiki was equipped with an editorial team to oversee postings and the system was designed to allow for anonymous posts.

Once the Hermes Wiki went live in 2007, the introduction was supported with a heavy internal marketing campaign. In much of the formal and informal communication, Wikipedia was used as an exemplary archetype of how to use the Hermes Wiki, thus supporting sense-making of the new tool. While generally received very well, users faced a couple of difficulties when trying to appropriate the new tool. For example, even though considered in the design phase, the question of how to behave in the Wiki illustrated the conflict between collaboration and hierarchy. Particularly the editing of articles originally authored by high-ranking corporate executives was perceived to be difficult by many. However, when first cases were observed, they positively influenced people's perception of the Wiki. Another case of resistance can be observed with respect to the technology. After the Wiki team realized that people found it hard to use the Wiki's markup language, a graphical user interface was developed that enabled "what you see is what you get"-editing (WYSIWYG). Beyond these difficulties and their solutions, the introduction of the Wiki also led to the surfacing of some conflict. The fact that people from various departments edited articles jointly was sometimes perceived as poaching of one department in the territory of another. When an employee started an article on a legally sensitive issue, for example, the legal department tried to intervene outside the wiki. Conflict also emerged through the question of who should be allowed to put what into the Wiki. While an article on a famous musician quickly became one of the most popular articles in the Wiki, it had little to do with Hermes. As indicated above, the Wiki's introduction also led to some conflict with the intranet already in place. The shift from centralized editors to decentralized crowds ultimately led to a reciprocal questioning of roles and right to exist. Nevertheless, introduction was perceived to be a success by the project team, its sponsors, and large parts of Hermes. Initially, almost 20% of possible user registered and about a quarter of those were active contributors. Quickly, the initial enthusiasm about the Wiki led to the production of about a 1,000 articles. This initial momentum also carried the Hermes Wiki through its first year. Despite a slight drop in usage after the initial excitement settled, the Wiki continues to be used. At the end of our fieldwork, the Hermes Wiki had about 350 active contributors (authors and commentators) and totaled at about 3,000 articles. On an average workday, the Wiki receives about 2,000 – 3,000 page visits.

Beyond the usage statistics, also the way the Wiki is perceived in the organization indicates that it has settled in. While often debated explicitly at the outset of the project, there currently seems to be only little discussion on the Wiki per se. It seems to have been integrated as a normal tool into the working routines of Hermes' employees. Also many of the organizational conflicts have been resolved. For example, Hermes seems to be much more appreciative of collaborative working styles across departmental boundaries and hierarchical levels. Another example is the adaptation of the intranet. It is no longer run by an editorial team, solely responsi-

ble for producing its content. It has rather adopted a more Wiki-based style: Regular employees can produce content that is then checked by a central editor. In total, the Hermes Wiki has developed very similar to the Wikipedia archetype; despite some important adaptations to the Hermes context (e.g., anonymous posting).

Most recently, many organizational sub-units have integrated the Wiki so tightly into their working processes that they are thinking about how to further adapt the tool to suit their group's particular needs. As a consequence, heterogeneous group usage patterns (e.g., different Wiki usage in marketing and PR than in operations; from documenting entire projects to not using it at all) have led to a trend towards establishing a Wiki farm. This would introduce more specialized, localized Wikis for special purpose groups. While the Hermes Wiki would provide an underlying platform for knowledge that pertains to the entire organization (list of common abbreviations, overview of projects, area maps, etc.), the group Wikis would allow for building up and developing specialized knowledge (e.g., procedures for firefighters or software developers).

Emergent Key Issues

As indicated earlier, we analyzed the observations we made as the case unfolded with three different theoretical sensitizing devices or lenses. Guided by an initial research interest in the adoption of Web2.0-based solutions, one of the authors and a team of colleagues applied a PT lens to study the adoption, adaptation, and appropriation of the Wiki at Hermes (Raeth et al. 2010). When carefully reflecting upon the results of this analysis, we noticed – perhaps not surprisingly – that the organization reacted in quite manifold ways to the introduction of the Wiki. The suggested PT, however, did not seem to account for or explain aspects such as the emergence of conflict between departments that had been far apart traditionally or of work practices which seemed to be in conflict with established organizational norms (e.g., criticizing superiors through editing their posts). Thus, our attention was drawn towards structurational approaches and their goal to explain the emergence and functioning of complex societal structures such as organizations. In a subsequent study (Raeth et al. 2011), we were thus able to discover the interaction of structures within and outside of the work place. At the same time, however, the technology vanished into the background and seemed to be little more than an opportunity for employees at Hermes to consider new working practices. Consequently, we turned to the ideas of Sociomateriality and its promise to reconcile the social and the material in a third study of the Hermes case (Raeth and Mueller 2011, 2012). The result was the description of dialectic processes of resistance and accommodation and how they contribute to better understand how the social and material are tuned to each other until they reach interactive stabilization.

Analyzing what happened at Hermes with three different lenses was based on one and the same case in all three instances. But, the story and its conceptual implications – in line with the shift in the researchers' interest and attention – differ quite significantly. Comparing the three different perspective, stories, and results, we noticed a number of conceptual phenomena that seem to illustrate how the shifting lenses change what we see – and what we get in terms of abstracted interpretations of the same empirical observation. In particular, five issues emerged: *the role and nature of technology, technological change, changing practice, organizational change, and understanding stability*. These have been identified through comparing the results from the three lenses as they seem to be issues that are present in all three stories, but played out differently across all three.

A first and perhaps rather pivotal issue is the very nature and role of technology itself. As the case description highlighted, the entire case – and our study accordingly – revolved around the introduction of a technological artifact into Hermes' organization: the Wiki. In this regard, how does changing theoretical perspectives yield a different interpretation of what this artifact is and how it impacts the case as it unfolds?

Second, one of the key issues we observed in the case was the change that occurred in the technological artifact – the Wiki – both pre as well as post go-live. As outlined above, the project team felt the need to adapt the off-the-shelve WikiMedia solution to the Hermes context and made respective changes. After the rollout, the introduction of the WYSIWYG-editor shows the need for adaptation. Most recently, the turn towards a spin-off of smaller, specialized wikis on top of the Hermes Wiki indicates that the technology still evolves and is continually adapted to the organization. How can these changes be understood and explained through the various lenses we investigate and what do the changes mean?

Third, one instance of change we find particularly noteworthy are changing practices within Hermes. Getting back to our case, we observed that before the Wiki project, the intranet was a strongly centralized medium to push official content out to the company's employees. A central editorial staff produced content that had to be signed-off by senior officers of the company before it was published. After that, the content was rather static. After the Wiki introduction, a considerably reduced editorial staff now serves a mere moderating role and the

production of content is decentralized. Also a lot of content that used to go on the intranet is now hosted in the Wiki. Consequently, central oversight has been reduced. While the project was primarily geared towards the Wiki, we suggest that the implications on the intranet can be understood as another instance of unintended consequence – which makes the intranet an interesting facet to study. But why did the practice of the intranet change and how did the various lenses we employed help us to make sense of what we see?

Fourth, contrary to technological change we also focus on change occurring in the organization. This change can manifest in many forms such as, for example, change in departmental structures or change in corporate strategies. Looking at the Hermes case, the organizational change manifests particularly in an increase in collaborative work practices. While not equally true for all parts of the organization, the company as a whole is more receptive of collaborative working styles today: people across the organization jointly write and edit articles on the wiki, the editorial practices of the intranet have changed towards a more democratic model, and ordinary employees feel empowered enough to revise postings of superiors. Shifting through lenses, how did the perception of organizational change and the explanations we found for it evolve?

Fifth, an important aspect of our study, also in terms of managerial implications, is the emergence of stability in organizational and technological aspects of the case. As the case description illustrates, the Wiki seems to have settled into Hermes quite well: it rarely is an issue for discussion or controversy anymore, users and usage have stabilized, and only little change to the Wiki as a technological artifact occurs anymore. But what does stability mean? What are the implications of this meaning for the emergence of stability? Again, the various theoretical lenses have allowed us to tap into very different concepts of stability.

Comparison and Discussion of Lenses

Based on the five key issues we identified in the previous paragraphs, and drawing on our introduction of the lenses provided in the foundations section, this section aims to compare all three lenses. That is, all phenomena will be looked at from the ESEC, the practice lens, and the mangle of practice in order to identify important similarities and differences and how these impact what we get.

The Nature and Role of Technology

In respect of the nature and role of technology, two aspects strongly influenced our observations and conclusions when applying a process theoretical lens. First, agency in this paradigm is generally attributed to human actors as events, activities, or choices are a central element of analyzing data from a process theoretical point of view. Second, and closely related, process theoretical analyses revolve around events and their sequence. The resulting interpretations aim at explaining an overall outcome as a result of a particular sequence of events. When applying this lens to the case, the main focus of our analysis thus was to investigate the process that leads to a successful introduction of the new technology into the organization. For us, technology rather seemed to be attributed the role of an instrument or tool used in actions or decisions made by human actors. It thus receives a rather passive role, as the focus of the analysis is more on the sequence of events leading from the artifact's initial state to a distinct target state. Unsurprisingly, this lens framed our research accordingly. When looking at the data, our primary focus was to understand how the Hermes project team acted in order to achieve their goal: a successful introduction of the Wiki. Said Wiki, however, was an a priori fixed concept for us, a technological artifact distinct from its surrounding with a set of clearly defined properties and characteristics. From a process theoretical perspective, the analysis then focused on what was done to facilitate its introduction. Examples for events our attention was drawn to are the training sessions and marketing campaigns conducted by the project team. All these occurred as events in the process chain leading to a successful introduction of the Wiki, were designed to counteract potential failure, or avoid altogether. We also framed changes to the Wiki itself in this way.

Switching to a structurational point of view produced severe impacts on the nature and role of the technological artifact in our analyses. In line with the social constructivist nature of this lens, technology almost seems to vanish in the background. While not equally true for all structurational positions, technology is mostly described not to have any structures embedded in it (Jones and Karsten 2008). As the main focus is on structures and their mutually constituent relationship with agency, technology is reduced to a mere opportunity for structuring in the social realm. Looking at the case, using a structurational approach thus makes it difficult to really capture and conceptualize the role of technology. In our structurational analysis the wiki seemed to be little more than a trigger for changes in Hermes' organizational structures. Accordingly, our attention shifted to-

wards consequences that emerged from the Wiki project on other parts of the organization. For example, the Wiki seemed to challenge the hierarchical and strongly functional nature of organizational routines at Hermes. Scrutinizing this effect with a structurational lens revealed, however, that this irritation cannot be attributed to the technology as such. The emergence of more collaborative working routines, as an unintended consequence of the Wiki project, rather is a result of interactions between different structures organizational actors are drawing upon to shape their actions: work and non-work structures. The structurational lens thus directed our attention to the conflict that arose between the ideas of Wikipedia as an organization (a source of structures agents draw upon to inform their actions when using one Wiki outside of Hermes) and the established organizational structures at Hermes. For example, agents would draw upon Wikipedia's structures of legitimation to justify why editing posts of colleagues from other departments or even superiors should not only be possible, but would be necessary to "correctly" enact the structural archetype Wikipedia within Hermes. As Wikipedia's structures of signification were used by executives and the project team to communicate the meaning of the Wiki (i.e., help users to make sense of the technology), sanctioning behavior that irritates organizational structure would jeopardize the enactment of the Hermes Wiki, thus putting the Wiki's anticipated positive effects at risk. The focus, however, remains on different sources of structure and how they influence agency.

When using the mangle of practice perspective, technology conceptually re-emerges as it becomes an important part of the story. Intimately woven into the very fabric of the case, the technological artifact plays an important role in explaining relationality. Humans are no longer just interacting with each other in the social realm, nor are conceptualizations restricted to abstract process chains or equally abstract structures. Through their actions, users equally engage with the social (i.e., structures) and the material (i.e., technology) and become part of an ontologically inseparable sociomaterial assemblage. Applying this lens to our case required us to pay much closer attention to the relations between the various entities involved in the resultant network and how the relations to each other reciprocally influenced them. Relations and influence emerged in our analysis through a dialectic process of resistance and accommodation. Neither social structure, nor process, nor technology alone accounted for this process; all of them were equally involved in and implicated by it. The conflicts that emerged through the cross-departmental collaboration in the Wiki, for example, turned out to be complex, interdependent processes in which the organization, actors across its various functional divisions, and the material technology itself were gradually tuned to each other. This starts with the inception of the KM initiative and the Wiki project. Both can be seen as a reaction to the perceived deficiencies with respect to knowledge work and sharing within Hermes. The very design of the Hermes Wiki, an adaptation of the WikiMedia engine, then becomes part of a process in which the material and the social are adapted to each other. This pertains to both the changes to the Wiki (e.g., soliciting articles prior to go-live) as well as towards the organizational practices (e.g., enabling anonymous posting) as discussed in the case description above. These, in turn, lead to a new round of resistance and accommodation. For example, conflict between the intranet and the Wiki emerges as the roles of both are not clearly defined and are counteracted by a definition of which content goes where. But also other resistance-accommodation-pairs emerge when using a structurational analysis: the emergence of non-work related articles and the subsequent negotiation of rules for Wiki content and conflict between departments and the need for the Wiki team to moderate the resolution are only two examples. In any of these instances, the sociomaterial lens enabled us to shed light on the mechanisms of resistance and accommodation and provided us with the conceptual tools to describe and explain how the relations between the various entities mangled into a sociomaterial assemblage changed as the project progressed.

Technological Change

From a process theoretical standpoint, changing the technology is only one among many events that depict the decisions of the project team to ensure that the project goals are achieved. These actors made conscious decisions to adapt the Wiki to Hermes' organizational requirements. As indicated above, the focus in this perspective is not on the changing artifact itself, but rather on the decisions made and problems encountered by users interacting with the technology. Change in the technology thus rather seems to be one of the consequences of these actions when applying a process theoretical perspective. Altogether, technological change rather seems to become the overall outcome a respective process theory would be concerned with; the effect-construct we would seek to explain. Even when focused on technology explicitly, explanations of such a theory would probably show how and why the events between a discrete starting state and a specific end state of the artifact led to its change. Consequently, it is not surprising that our process theoretical lens did not draw our attention to the technological change per se. In our analysis of the case, technological change rather became a means to achieve the goal of the Wiki project or the organizational KM initiative. This is connected closely to the observations on

the nature and role of technology when using a process theoretical framing. Looking at the events of the case, we were able to observe how the project team adapted the wiki before and after the go-live to make sure that the anticipated benefits were attained. Again, the focus is on the decisions made by the project team. Outcomes of one decision would create the antecedent conditions for the next event until the final outcome emerges. Focus then is on understanding how the decisions enabled this as necessary but not sufficient conditions. The change occurring in the technology would merely be one of these antecedents to implementation success.

Shifting our analysis towards a structurational lens changes the focus of the analysis. As technology itself cannot carry structure in this lens, the question is why does the change occur in the first place? Why do organizations such as Hermes not just simply enact any given technology in a way that fits to existing structures within the organization? As the technology vanishes in the background in this analysis, our focus shifted and technological change merely becomes a proxy for structural change; or a conflict between individual agency and organizational structure. Accordingly, technology is only implicated in as far as it is enacted in technologies-in-practice. If the resulting practices are in conflict with established organizational structures, then either technology or practice needs to be adapted. Technological change thus always results as a deterministic response to human agency that, in turn, shapes and is shaped by organizational structure. This is illustrated by the fact that the project team anticipated that the practices based on the Wiki would conflict with organizational structures of signification and legitimation. In this example, they thus changed the Wiki to allow for anonymous postings.

As we applied a mangle of practice perspective, our ontological position suggests that technological change can and should not be separated from the change occurring in the overall assemblage. Put differently, technological change is but one of the facets of the framing process towards a new assemblage. The main goal of this theoretical lens is to understand how the various entities mangled into such a sociomaterial assemblage relate to one another. As the unit of analysis shifts to the assemblage itself, technological change can be understood as a material response to a resistance encountered by any of the other actants involved in the assemblage. Technological change is thus only one observation that reflects the ongoing transformation of the performative assemblage. In doing so, the mangle of practice extends the very concept of technological change. The introduction of the WYSIWYG-editor can serve as an illustration. In the mangle perspective, this is rather not a dedicated change to the technology, but an accommodation of resistance encountered by the users. As the Wiki is more and more mangled into the working practices of the users, the issue of handling the Wiki's markup language increasingly becomes a resistance many users face. The WYSIWYG-editor then serves as an approach to overcome this resistance and changes the way the Wiki is used. Beyond examples like this, applying the mangle of practice lens also leads to the emergence of facets of technological change that complement the analysis of the role of the technological artifact. An example from the Hermes case is the creation of initial Wiki content. Filling the empty Wiki with a set of 500 articles changes the way the Wiki behaves in response to users searching for information. Consequently, these users will relate to the technology differently and adapt their practices.

Changing Practices

When we first used a narrative lens to study the introduction project of the Wiki at Hermes, the intranet was not a major part of our analysis. Focusing on the Wiki and the events surrounding it, the intranet first enters the stage of the analysis as a somewhat a priori fixed entity, a piece of the existing IS landscape at Hermes. To fit into this landscape, the Wiki has to be adapted to the intranet. At this stage of our analysis, however, the intranet is not implicated by the Wiki project. Despite the fact that problems in relation to the intranet emerged as the case unfolded, the process view on the Wiki's introduction does not allow us to study these two issues as one. As the evolution of the intranet is a facet of the project not directly related to the chain of events or decisions that lead to successful adoption and use of the Wiki, the changes in the intranet, its editorial policies, and its content do not emerge as core issues of the analysis. In fact, the Wiki is the only practice being studied.

In contrast to that, the structurational perspective shifted our attention towards the practices overarching the Wiki team, the intranet team, as well as the users. While the description of events is similar, our interpretation revolves around structures like signification and legitimation. These allow us to understand why the problems faced by the intranet team are actually an important part of the story. Looking through a structurational lens, attention is drawn towards the interaction of work and non-work structures. Before the introduction of the Wiki, and based on the existing organizational structures of signification, domination, and legitimation, the history of Hermes has led to a relatively stable enactment of organizational practices. Organizational members behaved according to the hierarchical and functional structures at Hermes. Also the technologies-in-practice based on the intranet, a technological artifact that was designed inside the organization, were non-conflicting enactments of these established structures. Introducing the Wiki then introduces structural elements foreign to

the organization. As an unintended consequence, users draw on structures of legitimation of Wikipedia (non-work) to illustrate that cross-functional collaboration is not against any norms and that even editing superiors' posts should not lead to sanction. As the Wikipedia archetype and its persistence in enactment are powerful enough to change organizational structures, suddenly the intranet (or the technologies-in-practice based thereon to be exact) is at odds with these new organizational structures. Consequently, departments that received the Wiki well started to reject the idea of having to go through a lengthy and hierarchical editorial process to publish knowledge. To avoid becoming insignificant, the intranet needed to adapt to these new practices. The resultant democratization of content production and the streamlined editorial process illustrate the changes in the intranet-based technologies-in-practice. In summary, the structural lens helped us to understand how the intranet story is embedded into the overall case and how and why the intranet changes from a dominant (initially, Wiki adapts to fit intranet) to a reactive part (intranet adapts to not be replaced by Wiki).

Particularly these latter issues of how and why were refined further when we applied the mangle of practice lens. While the principle structure of the changes remains the same, understanding the organization, its employees, as well as the technologies as an ontologically inseparable entity helps us to better understand why the intranet has to adapt (i.e., change in technologies-in-practice). While maintaining the principle mechanisms of the social described above, the mangle illustrates that the way that users relate to the intranet changes as the Wiki changes the material surrounding they are embedded in. This way, individuals' interpretations attribute meaning to the material and determine the way they relate to that material. As the intranet competes against the Wiki, those departments of Hermes receptive of collaborative ideals attribute less meaning to the intranet or simply see a more meaningful alternative emerge in the form of the Wiki. To maintain relations with these individuals, the material intranet engages in negotiating a possible accommodation of this comparative resistance. This way, the adaptation of the intranet does not seem like an adaptation to avoid structural conflict, but to maintain meaningfulness and remain a part of the sociomaterial assemblage.

Organizational Change

Looking at our conceptual framework, the narrative lens of process theory can equally be applied to many different units of analysis and phenomena of interest. With the discretionary choice of overall outcome we are interested in, we determine which of the many events preceding the emergence of this overall outcome will be relevant to our analysis. Looking at our process theoretical analysis of the Hermes case, the focus on the introduction process of the Wiki comes at the expense of the process of organizational change. While we did observe the changes in the field, the fact that they do not seem to relate to the issue of how to successfully introduce a Wiki makes us loose these observations in the analysis of the case. Revisiting our materials, it seems that organizational change is only shining though as an indication of a positive organizational response to the new technology. Instances such as the fact that people are revising superiors' posts are interpreted as hints to the Wiki's success, but neglect the underlying organizational change.

Looking at the discussion so far, it comes as no surprise that a structurational perspective reverses this picture, too. Also when trying to describe and explain organizational change, technology steps to the back; once more it only is an opportunity for structuring. The structurational effect of the Wiki at Hermes can rather well be illustrated using the concept of realms of action. Individuals who are part of an organization have a broad spectrum of possible actions in order to pursue their goals. Drawing on existing organizational structures, only a subset of this total number of options has meaning or can be legitimized. Before the introduction of the Wiki, for example, strongly collaborative work across departmental boundaries was rare at Hermes as an enactment of established organizational structures would not have yielded respective options for action. After introducing the Wiki, however, organizational members could draw on new norms or interpretive schemes to make sense of certain actions. Suddenly collaborating across departments, an option unavailable or not meaningful before, becomes a reasonable choice as it can be legitimized by drawing on the Wikipedia archetype the Wiki is based on. As a result, organizational structures of signification and legitimation are shaped by more and more individuals enacting collaborative behavior. The emergent organizational structures are a compromise between hierarchy and collaboration and provide Hermes employees with a new realm of action they can choose from. However, the Wiki as a technology per se does not play a significant role in this framing of the story.

Similarly to the descriptions in the sections above, the turn towards the mangle of practice has lead us to a more comprehensive framing of the overall phenomenon as a sociomaterial assemblage. Very similar to the explanations provided in respect of technological change above, this assemblage does not allow for an ontological separation of organizational change. Again, it rather is reflective of the underlying dialectic process of resistance and accommodation transforming the assemblage. As such, it is important to acknowledge that tech-

nology again re-emerges as an important facet of the story. This is not only due to the fact that all other aspects of the assemblage relate to technology and vice versa, but also due to technology's ability to influence the relationship among other, non-technological aspects. A case in point is the transformation of organizational practices at Hermes into more collaborative ones. Beyond the aspects of the social described above, technology is no longer just a trigger for the interaction of competing structures. Quite contrary, our mangle of practice perspective allows us to see how the various adaptations of the technology somehow document multiple intermediate stages of organizational development. As new practices have to be negotiated between the various actors involved in the social, these practices lead to respective adaptations in the material as well. Once implemented, certain parts of the organization might perceive these to be accommodations. Through their implementation, however, such changes may also be carried into other parts of the organization previously not in touch with the newly negotiated practice. Consequently, yet another round of resistance and accommodation occurs until the entire assemblage is at peace with the newly negotiated practices – or at least until a balance between mutual resistances is achieved. Thus, the mangle of practice perspective allows us to see the assemblage as a whole and to understand changes in any of its aspects as reflective of a larger transformation. Technology as a part of that assemblage, as well as the organization, is shaping and is shaped by this transformational process.

Understanding Stability

Through the process theoretical lens, stability can be seen as the culmination of the event chain into the desired overall outcome one is interested in. In our initial interpretation of the Hermes case, this overall outcome is the successful introduction of the Wiki into the organization. Consequently, the goal of the process is to a certain degree conceptualized ex ante and stability occurs by definition once the overall outcome has emerged. While leeway exists in respect of how observations are interpreted (i.e., which observations actually represent the desired outcome), the reverse logic of process theoretical considerations requires a defined starting point from which to go back. In the case of the Hermes Wiki, a first logical point to cut the theorizing would have been after go-live. However, through the various interactions between the technology and the organization, the overall goal was not yet achieved and an additional phase of events had to be conducted. In that phase, the Wiki team worked with training, advocated diffusion through heavy internal marketing, and worked towards resolving conflict. These events constitute important antecedents and need to be incorporated to explain the current state of stability.

Using the structurational lens, stability can be described as a situation in which chosen actions (agency) and structural properties are congruent and no conflict arises between them. Thus, enactment leads to a relatively stable selection of actions chosen and actions, in turn, lead to a reinforcement of structures already in place. As discussed earlier, the introduction of the Wiki constituted an opportunity for structuring. The technology-in-practice enacted in respect of the Wiki heavily drew upon structures of legitimation and signification for outside the organization. This leads to conflict in various instances. Through enactment in practice, however, both structures are gradually reconciled. For example, drawing upon Wikipedia's structures of legitimation to justify a higher degree in collaboration is accepted by the other members of the organization and, consequently, leads to a gradual adaptation of Hermes' organizational structures. Using this lens, the current stability in the case represents a situation in which the TiP in relation to the Wiki seems to be in accordance with the organizational structure; the organization has found a consistent pattern of using the Wiki to support its practices.

Drawing on the mangle of practice, the concept of interactive stabilization describes a situation in which resistances and accommodations are in balance. In other words, mutual relations between the various social and material aspect of practice are simultaneously stable across the entire assemblage. In the Hermes case, this lens allowed us to recognize a sequence of resistances and accommodations. In trying to establish such an interactively stable practice, both the material and the social are tuned. On the material side, prefilling the Wiki, allowing for anonymous posts, or spinning off specialized Wikis are important adaptations. As for the social, the emergence of collaborative practices, the establishment of clear roles in relation to the intranet, and the establishment of routines for conflict resolution represent important tuning. Through repeated iteration of resistance and accommodation, the overall assemblage is gradually transformed into a network of stable relationships. Looking at the iterative cycles of resistance and accommodation, however, we believe it is important to highlight that interactive stability only seems to be an analytical possibility. As the assemblage is constituted by a very complex mangle of the social and the material, the manifold relations it entails are subject to a myriad of influences that change their relationships. Thus, any balance seems to be delicate; and temporary at best.

Towards a Comparative Framework

Comparing the similarities, differences, and peculiarities of the three lenses across these five issues suggests a set of interesting conclusions with respect to the role of these three in the context of studying technology in organizations.

Looking at the *nature and role of technology* we observe that all three perspectives start off with the same description of the technological artifact. When we enter the analysis and interpretation of our case, however, the different lenses provide entirely differing stories concerning the role and nature of the technological artifact. The process theory perspective provides us with an understanding of the management's perspective of the Wiki. That is, the actors react in a ways that serves the goals formulated by management and engages in actions and choices, which are in favor of these goals. However, switching to the structurational perspective provides us with insight into the negotiations concerning technologies in practice and other structures, which are mutually shaped in practice, but draws our focus away from studying changes in technology. This leads us to the next observation, which refers to the mangle of practice lens. Here, the making and breaking of associations (Pickering 1995) within the sociomaterial assemblage leads us to focus on the each of its elements one of which is technology. In summary, we observe the very same starting point concerning the nature of technology, but leave for different trails on the timeline. That is, the nature of technology is interpreted very differently from lens to lens based on the focus we put on the elements in the case.

A similar observation is made in respect of *technological change*. Here, the process theory approach only describes the introduction and use of the Wiki to the organization, but not the change from the first Wiki artifact to the second, third, etc. The structurational approach does not do so as well. However, it describes the structural conflicts leading to the changes without focusing on technology. Engaging in the entanglement perspective closes this gap and urges the researcher to consciously focus on every perceivable element in the assemblage. We argue that it depends on the type of technology whether one lens or the other provides an advantage. A phenomenon involving a malleable technology, such as a Wiki, might benefit from sociomaterial analysis. On the other hand, the less a technology directly influences practice the more other lenses might bear important advantages.

Changing practices brings our attention to an issue we raised in table 1. As illustrated by the evolution of the intranet in the case, the PT transforms this aspect of the story into a side effect of the Wiki's introduction at Hermes. Again then, ST carefully points us to the complex hierarchies and power relations, which are inherent such a big organization's division of labor and of which the differing practices are made up. Just then, the mangle of practice calls attention to the even more complex web of things, relations, norms, and interpretations interwoven in the differing sociomaterial practices across the whole organization. Through the making and breaking of interconnections at different levels of analysis (from micro to macro), the whole organization can – intentionally or unintentionally – develop new performances.

This, too, is what made the description of *organizational change* possible through the mangle of practice lens; and less so trough the structurational perspective – at least in our case. An organization is defined by its practices. It is the organizing which creates its continuing existence (Weick 1979). In general, departments serve as hosts for tasks, roles, and routines (Cyert and Marchs 1992) which then form the basis for connections among larger groups (Perlow et al. 2004). The practices nested in these groups (e.g., a department or business unit), exhibiting tasks and routines, eventually form global (i.e., organizational) practices (Jacobides 2007). Going through the different lenses' interpretation, we observe that the outcome focused PT leads to an interpretation that offers an easy recipe to follow, a sort of best practice, but misses out on the phenomenon's complexities. The structurational perspective offers insights into the roles of power, reflexivity, and knowledge inherent to human agency and the tasks and routines, but misses out on the delicate role taken by technology. Finally, the mangle sometimes succeeds to uncover all the fine-grained connections between seemingly distant, even temporary, practices (such as between the legal department and the intern) that at one moment strongly influence the fate of certain associations within the assemblage that constitutes the organization.

As we progressed through the various lenses applied to the case, the issue of *stability* highlights a few important aspects as well. First and foremost, organizational change and the emergence of stability only seem to be accessible to the process theoretical studies if explicitly conceptualized as the phenomenon of interest; the study's "dependent variable." Even then, however, stability will be a rather static concept: first, as it has to be defined a priori and, second, as stability is always reached once the end of the linear event sequence is reached. While more complex conceptions exist (Van de Ven 1992), at least our conceptualization of a life cycle process

model seems to be a less than optimal choice to study the emergence of stability. With a shift towards the structurational, change and stability become endogenous. The interactions between structure and agency and the resultant enactment of practice and technology-in-practice allow for a more dynamic and interdependent notion of change. Accordingly, stability is not a predefined state conceptualized. It rather is an emergent state characterized by the congruence between existing structures and chosen enactments. Moreover, as highlighted by the case analysis, the turn towards the practice lens helped us understand how the professional work-life of individuals is implicated by their non-work life. Thus, this turn strongly enriched the case analysis in that it helped us to gain a much more refined look at the social in the case. This conceptual enrichment is continued further by introducing the relationality of our sociomaterial lens. While maintaining the idea of balance between parts of a whole introduced through ST, the mangle of practice has allowed us to see the assemblage as a mangle of social and material aspects and the reciprocal relations that connects them. As the complexity of the network of relationships increases, this final lens has also allowed us to recognize the temporary nature of stability and that any balance in such a complex phenomenon can only be a delicate and temporary matter, at best. Table 2 attempts a synthesis of these observations and provides a comparative framework.

Table 2. Comparative Framework

	ESEC	***Practice lens***	***Mangle of Practice***
The nature and role of technology	Technology is treated at the outset and acts as a tool for reaching a certain outcome	Technology moves to the background and acts as an opportunity for structuring	Technology is treated throughout and plays active as well as passive roles
Technological change	Technological change not treated per se; technology as an means of human action	Technological change results as a deterministic response to human agency	Technological change as a continuous process and part of the dialect between resistance and accommodation
Changing practice	Focus on a single practice leading to a specific outcome	Several practices as enacted structures and their interactions are taken into account	Several practices as a mangle of the social and the material and their interactions are taken into account
Organizational change	Organizational change appears as an indication of a positive organizational response to the new technology (e.g., a best practice)	Organizational change as a continuous process over power, intention, reflexivity, and other traits of human agency	Organizational change as a continuous process which reflects the ongoing dialect between resistance and accommodations
Understanding stability	Stability as the evolution of the process into the desired final outcome	In stability, structures have successfully been reconciled; new structures emerged and new social practices result	Stability evolves as interactive stabilization of the mangle's dialectic (i.e., resistance from the emergent practice requires only minimal accommodation)

In summary, the less our focus lies on the interplay between the whole and the parts, the more we might miss out on the emergence of organizational change – or any other complex phenomena for that matter. This becomes evident from the tighter focus concerning levels of analysis and technology in PT and ST in our examples. However, as researchers, we will not always have the access to all levels of analysis, might not be present in decisive moments when associations are made or broken, and could sometimes just miss important elements thanks our own cognitive limitations. The advantages and disadvantages arising from the sensitizing devices' demands concerning data sources, data analysis, and knowledge, however, are not the decisive questions. It is the researcher's goal, which should define the researcher's strategy. Thus, to answer our initial questions, the importance lies, on one hand, in *understanding* how to employ a theoretical lens and being aware of its implications (Mingers 2001). On the other hand, it also lies in the researcher's context. While the mangle of practice lens, for example, proved superior to the others in explaining the phenomenon in the context of our goal to investigate the interactions in organizational change, this might not be the case if we change our research goals. Hence, we stress that not only the *understanding* of the lens, but also, the *context* (i.e., researcher's goals and the phenomenon) are of major importance.

Conclusions

In this paper we investigated how three different theoretical lenses changed what we saw in a case of a corporate Wiki introduction and, consequently, what we got in terms of theoretical abstractions from our observations. We based this on a brief review of the history and constituents of narrative based PT analysis for Markus and Tanis' (2000) ESEC, a structurational analysis based on Orlikowski's (2000) practice lens, and an sociomaterial analysis based on Pickering's (1993, 1995) mangle of practice as different lenses to observe technology in organization. Maintaining a meta-theoretical stance, we used the comparison of these lenses to observe how our interpretation of the case changed and how that impacts theorizing. We reflected upon how the theoretical lenses have drawn our attention to different facts in the case. Moreover the different lenses sensitized us to different nuances of the phenomena we studied, thus leading to different theoretical accounts. As a result, reflecting upon the lenses allowed us to compare their implications for key issues potentially relevant to IS research and to draw conclusions with respect to when and why they bear potential to inform our theorizing.

In assessing this paper's implications, we feel that it is appropriate to caution researchers who wish to draw on our experiences with respect to the limitations of the paper at hand. First, we believe that the nature of the paper deserves discussion. As we use this paper to reflect on the case and the alternative theoretical lenses we have used, the manuscript presents a selection of observations that allowed us to illustrate how a change of the ontological position impacted the conclusions we draw from our observations. As such, none of the accounts presented and discussed above are able to elaborate on the emerging theories describing the empirical plane in sufficient depth. In the respective studies we have conducted (Raeth and Mueller 2011, 2012; Raeth et al. 2011; Raeth et al. 2010), manifold results have emerged: from a process theory on adoption and appropriation to a sequence of resistance and accommodation illustrating the framing of the social and the material in the Hermes case. As none of these results is presented here in full, the discussions we provide are based on a discretionary choice on our end and intended to be illustrations only. More comprehensive accounts of the original results can be found in the original papers. Second, the lenses we have chosen each represent but one example for interpreting the tenets of the respectively underlying ontological paradigms. To illustrate, Pickering's (1993, 1995) mangle of practice is only one approach to sociomaterial theorizing and we refrain from making any judgment with respect to its qualities in comparison with, for example, actor network theory (Latour 1992; Law 1992) or apparatus (Barad 2003). Further, the separation amongst Process Theory, Structuration Theory, and Sociomateriality is not as clear-cut as we make it appear. Instead, especially Sociomateriality is rather novel and far from a well-developed body of theory (Kautz and Jensen 2012). While we believe that similar sensitizing effects can be observed if comparing different lenses of the same paradigms, the individual lenses will certainly highlight different facets and nuances of the case. Third and finally, all of our observations and their comparisons are bound to the Hermes case. We would thus like to reemphasize the both reflective and meta-theoretical nature of this paper. While we hope that our observations will be helpful for others researching technology in organizations, the main goal of our paper was to make our experiences transparent and, consequently, accessible to other researchers interested in theorizing in this domain

Keeping these limitations in mind, we do however suggest that our study contributes to researching the technological, the organizational, and their interactions. Beyond the centrality of considerations with respect to the unit of analysis, our comparison should point researchers to the different conditions under which the respective paradigms will be a meaningful foundation for theorizing. In this regard, an important aspect we draw from our discussion is the potential of the ontological paradigm of Sociomateriality. In particular, the ability to account for the mutual entanglement of the material and the social through their relationality to each other in practice has allowed us to observe, interpret, and make sense of important nuances of the case.

While future research will have to investigate whether our observations reoccur when investigated in different settings, using different paradigms, and drawing on different lenses, we believe that our study also has implications for the organizations we study and inform. Beyond the theoretical interpretation, we thus also turn to the topic of practice. The question of practical relevance is of major importance to theory as we, as researchers, aim to describe but also inspires individuals', groups', organizations', and society's practices. At best, theory does impacts practice in different ways. The most obvious one might be to benefit from the deconstruction, analyses, and insights provided by structurational, sociomaterial, or very carefully crafted process theories. Also the multifaceted illustration by lenses focusing on practices might provide insights and possible interventions concerning certain groups of people within sociomaterial assemblages (e.g., customers, developers, managers). To put it simply, we strongly believe in theory's power to inform meaningful action in practice and that "nothing is quite so practical as a good theory" (Lewin 1945, p. 129).

References

Abbott, A. 1990. "A Primer on Sequence Methods," *Organizational Science* (1:4), pp. 375-391.

Bacharach, S.B. 1989. "Organizational Theories: Some Criteria for Evaluation," *Academy of Management Review* (14:4), pp. 496-515.

Barad, K. 2003. "Posthumanist Performativity: Toward and Understanding of How Matter Comes to Matter," *Signs: Journal of Women in Culture and Society* (28:3), pp. 801-831.

Barley, S.R. 1986. "Technology as an Occasion for Structuring: Evidence from Observations of Ct Scanners and the Social Order of Radiology Departments," *Administrative Science Quarterly* (31:1), pp. pp. 78-108

Bostrom, R.P., Gupta, S., and Thomas, D. 2009. "A Meta-Theory for Understanding Information Systems within Sociotechnical Systems," *Journal of Management Information Systems* (26:1), pp. 17-47.

Brief, A.P., and Dukerich, J.M. 1991. "Theory in Organizational Behavior: Can It Be Useful?," in: *Research in Organizational Behavior,* B.M. Staw and L.L. Cummings (eds.). Greenwich, CT, USA: JAI Press, pp. 327–352.

Burton-Jones, A., and Gallivan, M.J. 2007. "Toward a Deeper Understanding of System Usage in Organizations: A Multilevel Perspective," *MIS Quarterly* (31:4), p. 22.

Colquitt, J.A., and Zapata-Phelan, C.P. 2007. "Trends in Theory Building and Theory Testing: A Five-Decade Study of the Academy of Management Journal," *Academy of Management Journal* (50:6), pp. 1281-1303.

Corley, K.G., and Gioia, D.A. 2011. "Building Theory About Theory Building: What Constitutes a Theoretical Contribution?," *Academy of Management Review* (36:1), pp. 12-32.

Croon, A. 1998. "Reframing the Notion of Context in Information Systems Research," *Proceedings of IRIS 21*, pp. 139-150.

Cyert, R.M., and Marchs, J.G. 1992. *A Behavioral Theory of the Firm*, (2nd ed.). Cambridge, MA: Blackwell.

Dubin, R. 1978. *Theory Building*, (2. ed.). New York, NY, USA: Free Press.

Dwivedi, Y.K., Wade, M.R., and Schneberger, S.L. (eds.). 2012. *Information Systems Theory*. Heidelberg, Germany et al.: Springer.

Furfey, P.H. 2011. *The Scope and Method of Sociology: A Metasociological Treatise*. Whitefish, MT, USA: Literary Licensing.

Giddens, A. 1984. *The Constitution of Society*. Berkley, University of Caifornia Press.

Gregor, S. 2006. "The Nature of Theory in in Information Systems," *MIS Quarterly* (30:3), pp. 611-642.

Jones, M.R., and Karsten, H. 2008. "Gidden's Structuration Theory and Information Systems Research," *MIS Quarterly* (32:1), pp. pp. 127-157.

Kautz, K., and Jensen, T.B. 2012. "Sociomateriality - More Than Jargon Monoxide? Questions from the Jester to the Sovereigns," *ECIS 2012*, Barcelona.

Langley, A. 1999. "Strategies for Theorizing from Process Data," *Academy of Management Review* (24:4), pp. 691-710.

Latour, B. 1992. "Where Are the Missing Masses? Sociology of a Few Mundane Artefacts," in: *Shaping Technology, Building Society: Studies in Sociotechnical Change,* W. Bijker and J. Law (eds.). Cambridge, MA: MIT Press, pp. 225–258.

Law, J. 1992. "Notes on the Theory of the Actor-Network: Ordering, Strategy, and Heterogeneity," *Systemic Practice and Action Research* (5:4), pp. 379-393.

Lee, A.S. 1999. "Inaugural Editor's Comments," *MIS Quarterly* (23:1), pp. v-xi.

Lee, A.S. 2001. "Editor's Comments: MIS Quarterly's Editorial Policies and Practices," *MIS Quarterly* (25:1), pp. iii-vii.

Leonardi, P.M. 2011. "When Flexible Routines Meet Flexible Technologies: Affordance, Constraint, and the Imbrication of Human and Material Agencies," *MIS Quarterly* (35:1), pp. 147-167.

Lewin, K. 1945. "The Research Center for Group Dynamics at Massachusetts Institute of Technology," *Sociometry* (8:2), pp. 126-136.

Markus, M.L., and Robey, D. 1988. "Information Technology and Organizational Change: Causal Structure in Theory and Research," *Management Science* (34:5), pp. 583-598.

Markus, M.L., and Tanis, C. 2000. "The Enterprise System Experience — from Adoption to Success," in: *Framing the Domains of IT Research: Glimpsing the Future through the Past,* R.W. Zmud (ed.). Cincinnati, OH: Pinnaflex Educational Resources, pp. pp. 173-207.

Milton, S.K., and Kazmierczak, E. 2006. "Ontology as Meta-Theory: A Perspective," *Scandinavian Journal of Information Systems* (18:1), pp. 85-94.

Mingers, J. 2001. "Combining IS Research Methods: Towards a Pluralist Methodology," *Information Systems Research* (12:3), pp. 240-259.
Mingers, J., and Willcocks, L. (eds.). 2004. *Social Theory and Philosophy for Information Systems*. Chichester, UK: John Wiley & Sons.
Mohr, L.B. 1982. *Explaining Organizational Behavior - the Limits and Possibilities of Theory and Research*. San Francisco: Jossey-Bass Publishers.
Orlikowski, W.J. 1992. "The Duality of Technology: Rethinking the Concept of Technology in Organizations," *Organization Science* (3:3), pp. pp. 398-427.
Orlikowski, W.J. 2000. "Using Technology and Constituting Structures: A Practice Lens for Studying Technology in Organizations " *Organizational Science* (11:4), pp. 404-428.
Orlikowski, W.J. 2010. "The Sociomateriality of Organisational Life: Considering Technology in Management Research," *Cambridge Journal of Economics* (34:1), pp. 125-141.
Orlikowski, W.J., and Iacono, C.S. 2001. "Research Commentary: Desperately Seeking the "IT" in IT Research--a Call to Theorizing the IT Artifact," *Information Systems Research* (12:2), pp. 121-134.
Orlikowski, W.J., and Scott, S.V. 2008. "Sociomateriality: Challenging the Separation of Technology, Work and Organization," *The Academy of Management Annals* (2:1), pp. 433–474.
Petter, S., DeLone, W., and McLean, E. 2008. "Measuring Information Systems Success: Models, Dimensions, Measures, and Interrelationships," *European Journal of Information Systems* (17:3), pp. 236-263.
Pickering, A. 1993. "The Mangle of Practice: Agency and Emergence in Sociology of Science," *American Journal of Sociology* (99:3), pp. 559-589.
Pickering, A. 1995. *The Mangle of Practice: Time, Agency, and Science*. Chicago: University of Chicago Press.
Popper, K. 1980. *The Logic of Scientific Discovery*. London: Unwin Hyman.
Pozzebon, M., and Pinsonneault, A. 2005. "Challenges in Conducting Empirical Work Using Structuration Theory: Learning IT Research," *Organization Studies* (26:9), pp. pp. 1353-1376.
Raeth, P., and Mueller, B. 2011. "Technology and the Separation of Work and Non-Work Life: Two Sides of a Coin?," *Organizations and Society in Information Systems (OASIS Workshop 2011)* Shanghai, China.
Raeth, P., and Mueller, B. 2012. "Technology in Work and Non-Work Life: Two Sides of a Coin?," *72. Academy of Management Annual Meeting 2012*, Boston, MA, USA.
Raeth, P., Mueller, B., and Smolnik, S. 2011. "The Interaction of Organizational Structures and Technologies-in-Practice: A Structuralist Analysis," *32. International Conference on Information Systems (ICIS 2011),* D.F. Galletta and T.-P. Liang (eds.), Shanghai, China: Association for Information Systems.
Raeth, P., Urbach, N., Smolnik, S., Butler, B.S., and Königs, P. 2010. "The Adoption of Web 2.0 in Corporations: A Process Perspective," *AMCIS 2010 Proceedings*, Peru, Lima.
Ramiller, N.C. 2001. "Airline Magazine Syndrome: Reading a Myth of Mismanagement," *Information Technology & People* (14:3), pp. 287-304.
Ramiller, N.C., and Pentland, B.T. 2009. "Management Implications in Information System Research: The Untold Story," *Journal of Management Information Systems* (10:6), pp. 474-495.
Ritzer, G. 1990. "Metatheorizing in Sociology," *Sociological Forum* (5:1), pp. 3-15.
Ritzer, G. 2001. *Explorations in Social Theory: From Metatheorizing to Rationalization*. London, UK: Sage.
Sidorova, A., Evangelopoulos, N., Valacich, J.S., and Ramakrishnan, T. 2008. "Uncovering the Intellectual Core of the Information Systems Discipline," *MIS Quarterly* (32:3), pp. 467-A420.
Steinfield, C.W., and Fulk, J. 1990. "The Theory Imperative," in: *Organizations and Communications Technology,* C.W. Steinfield and J. Fulk (eds.). Newbury Park, CA, USA: Sage, pp. 13-25.
Suchman, L. 2007. *Human-Machine Reconfigurations: Plans and Situated Actions*, (2. ed.). Cambridge, MA, USA: Cambridge University Press.
Uto, S. 2005. *Constructics: A Methodology of Theory Construction*, (1. ed.). Washington, DC, USA: University Press Of America.
Van de Ven, A.H. 1992. "Suggestions for Studying Strategy Process: A Research Note," *Strategic Management Journal* (13:S1), pp. 169-188.
Van de Ven, A.H., and Poole, M.S. 1995. "Explaining Development and Change in Organizations," *Academy of Management Review* (20:3), pp. 510-540.
Venkatesh, V., Morris, M.G., Davis, G.B., and Davis, F.D. 2003. "User Acceptance of Information Technology: Toward a Unified View," *MIS Quarterly* (27:3), p. 48.
Wagner, E.L., Newell, S., and Piccoli, G. 2010. "Understanding Project Survival in an Es Environment: A Sociomaterial Practice Perspective," *Journal of the Association for Information Systems* (11:5), pp. 276-297.

Weaver, G.R., and Gioia, D.A. 1994. "Paradigms Lost: Incommensurability Vs Structurationist Inquiry," *Organization Studies (Walter de Gruyter GmbH & Co. KG.)* (15:4), pp. 565-589.
Weber, R. 2003a. "Editor's Comments: Still Desperately Seeking the IT Artifact," *MIS Quarterly* (27:2), pp. iii-xi.
Weber, R. 2003b. "Editor's Comments: Theoretically Speaking," *MIS Quarterly* (27:3), pp. iii-xii.
Weber, R. 2012. "Evaluating and Developing Theories in the Information Systems Discipline," *Journal of the Association for Information Systems* (13:1), pp. 1-30.
Weick, K. 1979. *The Social Psychology of Organizing*, (2nd ed.). New York: Random House.